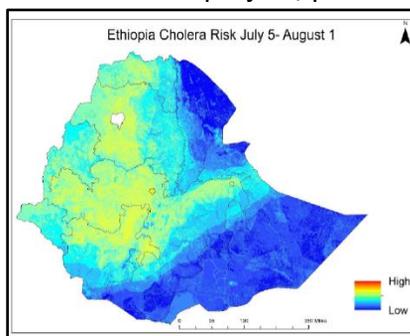
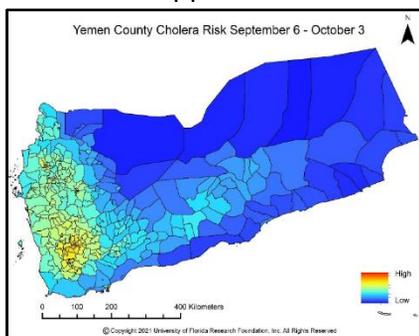


## QUARTERLY HAQ PROJECT HIGHLIGHT:

### PREDICTIVE ASSESSMENT OF TRANSMISSION CONDITIONS OF CHOLERA

Supported through a 2017 HAQ grant, **Antarpreet Jutla (U. of Florida)** has released the [Vibrio Prediction Hub](#), which includes interactive maps to explore the presence of pathogenic *Vibrio* spp in Yemen and Ethiopia. This project integrates precipitation and air and ocean temperature data from MODIS, GPM, MERRA-2, and ORNL LandScan population data. Weekly forecasts are produced (four weeks in advance) for epidemic and endemic models of cholera in Yemen, Ethiopia, and other African nations. This tool is operational to project partners – UNICEF, Red Cross Climate Center, and UN Office for the Coordination of Humanitarian Affairs – to inform cholera risk in this geographic region. The team is working on capacity building activities that aim to engage end-users for sustained use of the web-based application. To learn more about this project, please read the [NASA web feature](#).



Predicted trigger risk of cholera in Yemen (September 2021) and Ethiopia (July 2021) (Left). The prototype smartphone capable web-hub aims to enhance cholera risk communication with decision-makers (Right). Credits: NASA/A. Jutla

## NASA CELEBRATES APPLIED SCIENCES WEEK 2021

In August 2021, the NASA Applied Sciences Program hosted [Earth Science Applications Week 2021](#), a four-day virtual event to learn the practical applications of NASA Earth science data by sharing highlights from researchers and partners and interacting with early-career professionals. Daily plenary sessions provided insight into NASA's Applied Sciences projects, followed by flash talk sessions and opportunities to network and engage. Sessions were coordinated by the DEVELOP Program's summer participants. For the HAQ session, **Laura Judd (NASA LaRC)** and **Helena Chapman (NASA HQ)** nominated presentations from two HAQ researchers – **Julia Gohlke (Virginia Tech)** and **Assaf Anyamba (NASA GSFC/USRA)**. Then, HAQAST Lead **Tracey Holloway (U. of Wisconsin-Madison)** provided an update on the NASA Health and Air Quality Applied Sciences Team ([HAQAST](#)) (2021-2025) and launched the [This is HAQAST video](#).



Credit: NASA/U.Group

## HEALTH AND AIR QUALITY APPLICATIONS APPLIED SCIENCES PROGRAM

**JOHN HAYNES**  
PROGRAM MANAGER  
HEADQUARTERS

**SUE ESTES**  
SENIOR ASSOCIATE  
U. OF ALABAMA-  
HUNTSVILLE

**HELENA CHAPMAN**  
ASSOCIATE  
HEADQUARTERS/BAH

**LAURA JUDD**  
ASSOCIATE  
LANGLEY RESEARCH CENTER



## HAQAST TIGER TEAMS

In September 2021, five NASA HAQAST [Tiger Teams](#) were selected, covering environmental justice, improving data usability, urban planning, air quality outreach, and health effects from fires. These projects will work with a variety of NASA and NOAA satellites and related data products relevant to health and air quality. More information can be found [here](#).

- ❑ **Satellite Data for Environmental Justice (SD4EJ)** (Leads: Susan Anenberg and Qian Xiao)
- ❑ **Enabling Stakeholder Access and Utilization of Data Products for Health and AQ Applications** (Lead: Kevin Cromar)
- ❑ **Communicating Uncertainties of Satellite-based NOx Emissions for Urban Planning** (Lead: Dan Goldberg)
- ❑ **Enabling USEPA to Ingest High-frequency Satellite Air Quality Data into the AirNow System** (Lead: Pawan Gupta)
- ❑ **Fused Earth Observations to Quantify Health Impacts from Agricultural Fires** (Leads: Sheryl Magzamen and Amber Soja)

## EM PUBLICATIONS ABOUT AIR QUALITY

The September 2021 [issue](#) (*New Insights in Air Quality Monitoring Using Satellite Data*) of the EM environmental magazine of the Air & Waste Management Association featured articles by HAQ PIs and collaborators on satellite data.

- ❑ **The Four Things to Know about Satellite Data for Air Quality Management** (by Tracey Holloway, Jennifer Bratburd)
- ❑ **The Present and Future of Satellite Observations for U.S. Air Quality Management** (by Ana Prados, Paul Vernier, Bryan Duncan, Lok Lamsal)
- ❑ **TROPOMI: A Revolutionary New Satellite Instrument Measuring Nitrogen Dioxide Air Pollution** (by Daniel Goldberg, Susan Anenberg, Gaige Kerr, Zifeng Lu, David Streets)
- ❑ **What Will TEMPO Offer Air Quality Managers?** (by Aaron Naeger, Michael Newchurch, Tom Moore, Kelly Chance)
- ❑ **Leveraging Satellite Data to Address Air Pollution Inequities** (by Susan Anenberg, Gaige Kerr, Daniel Goldberg)



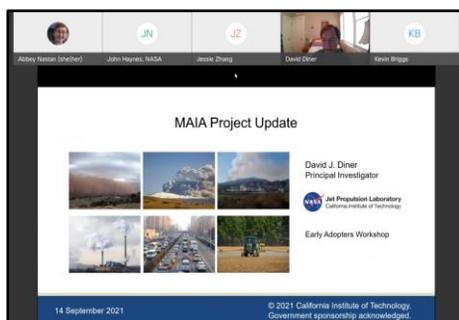
Credit: EM magazine webpage

## NASA HAQ INVESTIGATOR UPDATES

- ❑ **Susan Anenberg (George Washington U.):** She was appointed to the WHO's Global Air Pollution and Health Technical Advisory Group in July 2021 and the US EPA's Science Advisory Board with a dual appointment to its new Climate Science Board in August 2021. She also co-authored the *STAT* article, [The pandemic made clear who doesn't get to breathe clean air. Now what?](#), in August 2021.
- ❑ **Assaf Anyamba (NASA GSFC/USRA):** He served on the *Environmental Security and Economic Impact of Climate Change in Africa* panel of the 4<sup>th</sup> Annual Defense Intelligence Agency (DIA) Joint Military Intelligence Training Center (JMITC) – Middle East/Africa Regional Center (MARC) Africa Symposium in July 2021.
- ❑ **John Haynes (NASA HQ):** He presented on the Breezometer [webinar](#), *Environmental Reporting in the Era of Climate Change: Expert Opinions*, in September 2021.
- ❑ **Daniel Tong (George Mason U.):** His research was highlighted in the [WMO Airborne Dust Bulletin](#) in July 2021 and the *Arizona Center for Investigative Reporting* article, [Scientists work to unravel fungus ecology as Valley fever expands throughout West](#), in September 2021.
- ❑ **Ben Zaitchik (Johns Hopkins U.):** He serves as Co-Chair of the WMO COVID-19 Task Team, where the team has coordinated a series of [Virtual COVID-19 Roundtables](#) since June 2021.

## MAIA HOLDS ITS THIRD ANNUAL EARLY ADOPTERS WORKSHOP

In September 2021, the NASA Multi-Angle Imager for Aerosols (MAIA) mission held its third annual Early Adopters Workshop, sponsored by the NASA HAQ Applied Sciences Program. **Abbey Nastan (Jet Propulsion Laboratory)**, the MAIA Deputy Program Applications Lead, led the virtual workshop, which featured recent project updates. She also shared the debut of the MAIA simulated data, which will help Early Adopters prepare for MAIA data before launch (currently no earlier than late 2022). The MAIA team provided guided tutorials, as well as a Jupyter notebook and user guide, to facilitate Early Adopter's use of the simulated data. More than 140 people (including 80 in-person participants) attended the Early Adopters workshop and rated the event highly in the post-workshop feedback survey. To request access to the workshop recording or MAIA simulated data products, please communicate with the [MAIA Team](#) and complete the brief [application form](#).



Credit: A. Nastan

## TEMPO EARLY ADOPTERS PROGRAM UPDATE

Over the last quarter, **Aaron Naeger (TEMPO Deputy Program Applications Lead, U. of Alabama in Huntsville)**, continued to engage existing and new end-users about the latest status of the TEMPO mission, its anticipated products, and application benefits of data after launch (currently expected December 2022). These activities included:

- ❑ Organizing a town hall at the 33<sup>rd</sup> Annual Conference of the International Society for Environmental Epidemiology, titled, *Revolutionary Air Quality Observations from the NASA TEMPO Mission for the Environmental Epidemiological Community*
- ❑ Publishing a TEMPO article, *What Will TEMPO Offer Air Quality Managers*, in the Air Waste Management Association (AWMA) *EM* magazine in September 2021
- ❑ Publishing a workshop summary, *Revolutionary Air-Pollution Applications from Future TEMPO Observations*, in the *Bulletin of the American Meteorological Society (BAMS)* magazine

The next [TEMPO Early Adopters workshop](#) will be held on November 10, 2021.



TEMPO. Source: [TEMPO website](#)

## GEO HEALTH COMMUNITY OF PRACTICE HOLDS BIWEEKLY TELECONS



The Group on Earth Observations (GEO) [Health Community of Practice](#) (CoP) – led by **John Haynes (NASA HQ)** and **Juli Trtanj (NOAA)** – continues to coordinate community teleconferences that leverage expertise and share Earth observation data and tools to support health decision-making. On average, 40 attendees participate in each telecon. Below is a synopsis of each meeting.

- ❑ July 2021: Cascade Tuholske (Columbia U.'s Earth Institute) described a new daily urban extreme heat dataset (Global High Resolution Daily Urban Extreme Heat Exposure, UEH-Daily).
- ❑ August 2021: Natasha Sadoff (NASA Goddard/SSAI) described the NASA Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission.
- ❑ September 2021: The *Special Edition: The Americas* telecons offered 21 flash talks on infectious diseases, public health infrastructure, capacity building, and community-based applications.

The **Small Work Groups** leads – Heat (Ben Zaitchik, Johns Hopkins U.; Cascade Tuholske, Columbia U.'s Earth Institute); Infectious Diseases (Antar Jutla, U. of Florida); Food Security and Safety (Dorian Janney, NASA GSFC/GPM); Air Quality (Eric Klos, DailyBreath; Pawan Gupta, USRA/NASA MSFC); and Health Care Infrastructure (John Balbus, NIEHS; Andreas Skouloudis, iSteep.org) – continue to leverage expertise with CoP members to provide scientific and technical knowledge on selected health-related topics for specific project tasks.

## AMERIGEO WEEK 2021

In August 2021, the NASA HAQ Team participated in AmeriGEO Week 2021, hosted by the Government of El Salvador and the Central American Integration System (SICA, in Spanish), which showcased how Earth observations are contributing to AmeriGEO's five thematic priorities, with over 700 attendees. Notably, this event was the first public engagement of the AmeriGEO Health thematic community, with more than 120 attendees.

The ***Using Earth Observations for Public Health Surveillance*** session – facilitated by **John Haynes (NASA HQ)**, **Juli Trtanj (NOAA)**, and **Helena Chapman (NASA HQ/BAH)** – focused on emerging global health challenges as a leading priority in the upcoming decade. Panelists included Ana Stewart-Ibarra, Ana Watson, and Marcella Ohira (IAI); Cascade Tuholske (CIESIN); Ben Zaitchik (Johns Hopkins U.); Pablo Mendez-Lazaro (U. of Puerto Rico Medical Sciences Campus); William Pan (Duke U.); and John Malone and Prixia del Mar Nieto (Louisiana State U.)



Credit: GEO Health Community of Practice

The session also supported the Belmont Forum's *Collaborative Research Actions on Climate, Environment, and Health in the Americas* Workshop, which aimed to identify synergies for the development of research networks that address national priorities related to climate, environment, and health. Also, a total of 21 posters by GEO Health CoP members were presented during the break-out poster session. We invite everyone to view the [recorded sessions!](#)

## ENHANCED AIR QUALITY MONITORING DURING TRACER-AQ

In September 2021, NASA partnered with DOE TRACER, TCEQ, BOEM, and several academic institutions to collect enhanced air quality measurements over the Houston/Gulf of Mexico region for the TRACER-Air Quality (AQ) field campaign. Led by **Laura Judd (NASA LaRC)** and **John Sullivan (NASA GSFC)**, NASA deployed the Johnson Space Center Gulfstream-V outfitted with instrumentation built to support the collection of TEMPO-proxy data. Two ground-based ozone lidars and several other ground-based remote sensors were also deployed, collecting data during two multi-day ozone air quality events.

Science goals of TRACER-AQ include continued research into the impact of meteorology on ozone chemistry in this coastal urban environment, air quality model evaluation, preparation for [TEMPO](#) science, and updated research on [pollution inequality](#) in the Houston region.

Media: [NASA Study Examines Houston-area Air Quality Issues](#)

Website: <https://www-air.larc.nasa.gov/missions/tracer-aq/index.html>



Science crew ready for a 9-hour research flight!  
Credit: L. Judd (NASA/LaRC)



G-V preflight on September 8, 2021  
Credit: L. Judd (NASA/LaRC)

## HAQ COMMUNITY ENGAGEMENT

The NASA HAQ team (**John Haynes, NASA HQ; Helena Chapman, NASA HQ/BAH**) conducted webinars that introduced the HAQ program and key examples of using Earth observations for public health applications.

- ❑ **NASA Earth Science Division:** J. Haynes presented at the NASA GSFC Climate & Environmental Health monthly meeting, and H. Chapman presented *Publishing the Sciences* for the NASA ESD undergraduate summer internship experience (32 interns).
- ❑ **Georgetown University:** J. Haynes and H. Chapman gave a lecture, *Spatialization and Dynamics of COVID-19 and other Infectious and Vector-borne Diseases: Advances in Remote Sensing*, as part of the Interdisciplinary Seminars in Global Infectious Diseases course (15 students).
- ❑ **Uniformed Services University of Health Sciences:** H. Chapman presented *Using Earth Observations to Enhance Public Health Surveillance* for the Journal Club of Occupational and Environmental Medicine and Preventive Medicine residency programs (30 physicians).

## NASA CELEBRATES INTERNATIONAL DAY OF CLEAN AIR FOR BLUE SKIES

Each September, the International Day of Clean Air, recognized by the United Nations, aims to increase awareness about air quality. On the International Day of Clean Air for blue skies 2021, the NASA HAQ and Communications Teams posted a feature on the NASA Applied Sciences Program [website](#) to highlight the two-fold challenge of health and climate impacts to achieve a healthy planet. The article shared two multidisciplinary collaborations between air quality scientists and community stakeholders: [Tracking Air Quality with TRACER-AQ \(TRACER-AQ\)](#) and the NASA Health and Air Quality Applied Sciences Team ([HAQAST](#)).

## ONE HEALTH IN THE NEWS

In August 2021, the U.S. Department of State Bureau of Educational and Cultural Affairs sponsored 10 participants representing six countries for the International Visitor Leadership Program on Global Health Security and Combating Infectious Diseases. Participants engaged with experts through interactive roundtables, lectures, and discussions. **John Haynes (NASA HQ)** and **Helena Chapman (NASA HQ/BAH)** offered talks that highlighted innovative applications of NASA Earth observations to examine ecosystem risks that influence the global spread of infectious diseases. Participants learned about the One Health concept and the value of multidisciplinary collaborations that leverage expertise to address global health priorities.

## LOOKING AHEAD

### ARSET Trainings:

[Introduction to NASA Resources for Climate Change Applications](#)

September 29 – October 6, 2021

### Virtual and Hybrid Meetings:

[A&WMA Visibility Conference](#)

October 5-8, 2021

[HAQ Annual Team Meeting](#)

October 12 and 20, 2021

[American Public Health Association Annual Meeting & Expo](#)

October 24-27, 2021

[American Geophysical Union Fall Meeting](#)

December 13-17, 2021

## PACE APPLICATIONS WORKSHOP

In September 2021, **Erin Urquhart Jephson (NASA GSFC/SSAI)** and **Natasha Sadoff (NASA GSFC/SSAI)** led the 2021 [NASA PACE \(Plankton, Aerosol, Cloud, ocean Ecosystem\) Applications Workshop](#). This event focused on future uses of [PACE](#) satellite data, products, and applications to support decision-making in water resources, air quality and health, climate, disasters, and ecological forecasting. **Susan Anenberg (George Washington U.)** and **Helena Chapman (NASA HQ/BAH)** participated in the *Engaging with the PACE AQ Community and Understanding Their Needs* session.



Credit: [PACE webpage](#)

## RECENT COMMUNICATIONS

### NASA

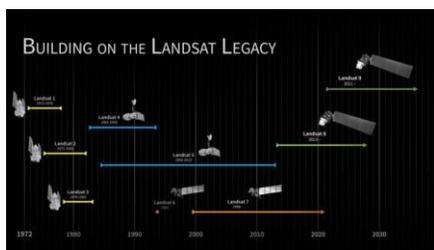
☐ [NASA Study Examines Houston-area Air Quality Issues](#) (Joe Atkinson, NASA LaRC)

### NASA Applied Sciences Program

☐ [NASA HAQAST Launches Five Innovative Tiger Teams](#) (Jenny Bratburd, HAQAST Outreach Coordinator)

## LAUNCH OF LANDSAT 9

Landsat 9 – a partnership between NASA and the U.S. Geological Survey – was successfully **launched** from Vandenberg Space Force Base on September 27, 2021. This **mission** will continue the Landsat program’s critical role since the 1970s in monitoring, understanding and managing the land resources needed to sustain human life. The instruments aboard – the Operational Land Imager 2 (OLI-2) and the Thermal Infrared Sensor 2 (TIRS-2) – will measure 11 wavelengths of light reflected or radiated off Earth’s surface.



Credit: NASA

## PAST

### **ARSET Training:**

**[Monitoring Coastal and Estuarine Water Quality: Transitioning from MODIS to VIIRS](#)**

September 14-21, 2021

**[Introduction and Access to Global Air Quality Forecasting Data and Tools](#)**

September 23-30, 2021

### **Virtual Meetings:**

**[Earth Science Applications Week](#)**

August 9-12, 2021

**[AmeriGEO Week](#)**

August 23-27, 2021

**[2021 PACE Applications Workshop](#)**

September 15-16, 2021

## PUBLICATIONS

[Integrated Assessment of Global Climate, Air Pollution, and Dietary, Malnutrition and Obesity Health Impacts of Food Production and Consumption between 2014 and 2018](#). *Environmental Research Communications*. (C.S. Malley...**S.C. Anenberg**, B. Mantlana, T.P. Robinson)

[Satellite Monitoring for Air Quality and Health](#). *Annual Review of Biomedical Data Science*. (**T. Holloway**, D. Miller, **S. Anenberg**, et al.)

[Secondary Organic Aerosols from Anthropogenic Volatile Organic Compounds Contribute Substantially to Air Pollution Mortality](#). *Atmospheric Chemistry and Physics*. B.A. Nault, D.S. Jo, B.C. McDonald, et al.)

[Intensity and Frequency of Extreme Novel Epidemics](#). *PNAS*. (M. Marani, G.G. Katul, **W.K. Pan**, A.J. Parolari)

[Temporal and Spatial Autocorrelation as Determinants of Regional AOD-PM2.5 Model Performance in the Middle East](#). *Remote Sensing*. (K. Chau, **M. Franklin**, H. Lee, M. Garay, O. Kalashnikova)

[Personal Interventions for Reducing Exposure and Risk for Outdoor Air Pollution: An Official American Thoracic Society Workshop Report](#). *Annals of the American Thoracic Society*. (R.J. Laumbach, **K.R. Cromar**, G. Adamkiewicz, et al.)

[Effects of COVID-19 Lockdowns on Fine Particulate Matter Concentrations](#). *Science Advances*. (M.S. Hammer, A. van Donkelaar, **R.V. Martin**, et al.)

[The Association between Outdoor Artificial Light at Night and Breast Cancer Risk in Black and White Women in the Southern Community Cohort Study](#). *Environmental Health Perspectives*. (**Q. Xiao**, G.L. Gierach, C. Baure, W.J. Blot, P. James, R.R. Jones)

[COVID-19 Pandemic Reveals Persistent Disparities in Nitrogen Dioxide Pollution](#). *PNAS*. (G. Hunter Kerr, **D. L. Goldberg**, **S. C. Anenberg**)

[Fingerprints of a New Normal Urban Air Quality in the United States](#). *Journal of Geophysical Research: Atmospheres*. (S. Kondragunta, Z. Wei, B.C. McDonald, **D.L. Goldberg**, **D.Q. Tong**)